Remarks

The present amendment responds to the Official Action dated December 13, 2004. The Official Action objected to the specification as assertedly not providing antecedent basis for "a second substrate" in claim 10. The Official Action objected to the drawings as not showing the "second substrate" recited in claim 10. The Official Action rejected claim 7 under 35 U.S.C. § 112, 2nd paragraph as assertedly being indefinite in the recitation of 5 nF/cm^2. The Official Action rejected claims 1-5, 12, 15 and 18 under 35 U.S.C. § 102(b) as being assertedly anticipated by Beuhler et al., U.S. Patent No. 6,342,164 (Beuhler). The Official Action rejected claims 1, 6, 12 and 19 under 35 U.S.C. § 102(b) as being assertedly anticipated by Srinivasan et al., U.S. Patent No. 5,731,235 (Srinivasan). The Official Action rejected claim 7 under 35 U.S.C. § 103(a) as being assertedly obvious over Srinivasan. The Official Action rejected claims 1, 8-13 and 17 under 35 U.S.C. § 103(a) as being assertedly obvious over Dimitrakopoulos et al., U.S. Patent No. 5,981,970 (Dimitrakopoulos) in view of Beuhler. The Official Action rejected claim 14 under 35 U.S.C. § 103(a) as being assertedly obvious over Beuhler. The Official Action rejected claim 16 under 35 U.S.C. § 103(a) as being assertedly obvious over Srinivasan in view of Tickle U.S. Patent No. 4,420,497. These grounds of rejection are addressed below. Claims 12, 15, 16 and 18 have been amended to be more clear and distinct. New claims 20-33 have been added. Claims 1-11, 13 and 14 have been cancelled without prejudice. Claims 12 and 15-33 are presently pending.

The Objection to the Specification

The specification was objected to as there assertedly is no support in the specification for the limitation of "a second substrate on said dielectric layer" as recited in claim 10. Claim 10 has been cancelled without prejudice. None of the claims as now presented recites a "second substrate". This objection is accordingly traversed as moot.

The Objection to the Drawings

The drawings were objected to as there assertedly is no showing of "a second substrate on said dielectric layer" as recited in claim 10. Claim 10 has been cancelled without prejudice. None of the claims as now presented recites a "second substrate". This objection is accordingly traversed as moot.

The Rejection Under 35 U.S.C. § 112

Claim 7 stands rejected under 35 U.S.C. § 112, 2nd paragraph as assertedly being indefinite in the recitation of 5 nF/cm^2. Claim 7 has been cancelled without prejudice. None of the claims as now presented recites "nF/cm^2". This rejection is accordingly traversed as moot.

The Rejection of Claims 1-5, 12, 15 and 18 under 35 U.S.C. § 102(b)

Claims 1-5, 12, 15 and 18 stand rejected under 35 U.S.C. § 102(b) as assertedly anticipated by Beuhler. This rejection is respectfully traversed in view of the claim amendments above and the discussion below. As to claims 1-5, this rejection is moot as such claims have now been cancelled without prejudice.

Claim 12 has been amended to be more clear and distinct. Claim 12 now recites the step of: "providing a reaction initiator on said substrate prior to providing said dielectric layer on said substrate, wherein the providing of said dielectric layer does not deactivate a portion of said reaction initiator located near entrances of said through holes." Claim 12 further now recites that in the step of providing a second dielectric material that at least partially blocks said through holes, such second dielectric material "reacts with said reaction initiator." New claims 20-22, directly or indirectly dependent from claim 12, have also been added.

Claim 15 has also been amended to be more clear and distinct. Claim 15 has now been converted into independent form. Claim 15 maintains its recitation, as originally filed, of the step of "providing a reaction initiator on said opposite side of said dielectric layer". Claim 15 now further recites the steps of: "coating a reaction initiator deactivator on said reaction initiator except at regions overlying through holes"; and "providing a second dielectric material that reacts with said reaction initiator at such regions and which then at least partially blocks said through holes." New claim 23 has been added, dependent from claim 15. Claim 23 further provides that the step of coating the deactivator comprises the step of transferring the deactivator from a flat stamping surface onto the reaction initiator. See, for example, the specification at page 24, line 9 through page 25, line 19. New claims 24-28, directly or indirectly dependent from claim 15, have also been added.

Claim 18 has additionally been amended to be more clear and distinct. Claim 18 is now dependent from claim 15, and has been further amended to recite "wherein said deactivator leaves said reaction initiator uncoated at pits and bumps".

Beuhler relates to dielectric films in which pinholes are filled by photopolymer plugs. Col. 1, lines 9 and 10. Buehler points out that one source of pinholes may result from the desire

to form very thin dielectric films. Col. 1, lines 17 and 18; col. 2, lines 16-18. As shown in Figs. 1 and 2, a photopolymer 20 has been applied to a dielectric surface 16 of the dielectric film 10, wherein pinholes 11 also contain the photopolymer. Col. 2, lines 21-23. The dielectric film is exposed to actinic radiation from a direction opposite of dielectric surface 16, as shown by the arrows in the Figure. Photopolymerization initiation, referred to as "activation", only occurs for the photopolymer exposed by pinholes 11. The dielectric film is opaque to the actinic radiation, and acts as a mask against activating the portion of the photopolymer that is masked behind dielectric film 10. As shown in Fig. 4, one obtains a dielectric film 10 wherein pinholes 11 contain photopolymer plugs 21. Col. 2, lines 25-37. Similarly, in Fig. 7, photopolymer 20 is applied over dielectric surface 16 such that channels 18 contain photopolymer. The composite foil is then exposed to actinic radiation on surface 22 in a direction opposing dielectric surface 16. Only the portion of the photopolymer exposed by the channels 18 is exposed to the radiation, because one or both of the metal foil 12 and the dielectric film 10 is opaque to the radiation and acts as a mask. Col. 3, lines 44-53.

Buehler fails to disclose and fails to suggest providing a reaction initiator on a substrate prior to providing a dielectric layer on such a substrate. Buehler instead merely discloses providing a photopolymer on a dielectric film, which is then selectively photopolymerized. Buehler's reference to "initiation" refers to photopolymerization by actinic radiation, and does not refer to the provision of a reaction initiator. Moreover, Buehler fails to disclose and fails to suggest the provision of a second dielectric material that reacts with such a reaction initiator. Buehler accordingly fails to disclose and fails to suggest claim 12.

Buehler also fails to disclose and fails to suggest providing a reaction initiator on a substrate after providing a dielectric layer on such a substrate. Buehler instead merely discloses

providing a photopolymer on a dielectric film, which is then selectively photopolymerized. Buehler further fails to disclose and fails to suggest the step of coating a reaction initiator deactivator on such a reaction initiator except at regions overlying through holes. Buehler additionally fails to disclose and fails to suggest the step of providing a second dielectric material that reacts with such a reaction initiator at such regions and which then at least partially blocks through holes. Buehler accordingly fails to disclose and fails to suggest claim 15. Buehler further fails to disclose and fails to suggest such a method in which such a deactivator leaves such a reaction initiator uncoated at pits and bumps, and wherein such a second dielectric material at least partially fills pits and at least partially smoothes areas surrounding bumps in a manner that reduces roughness. Buehler accordingly fails to disclose and fails to suggest claim 18.

The Rejection Of Claims 1, 6, 12 And 19 Under 35 U.S.C. § 102(b)

Claims 1, 6, 12 and 19 stand rejected under 35 U.S.C. § 102(b) as assertedly anticipated by Srinivasan. This rejection is respectfully traversed in view of the claim amendments above and the discussion below. As to claims 1 and 6, this rejection is moot as such claims have now been cancelled without prejudice.

Srinivasan relates to methods of forming silicon nitride films, forming capacitor dielectric layers, and forming capacitors. Col. 1, lines 7-9. Srinivasan discloses that pin-holes through thin layers of silicon nitride undesirably reduce film density and result in undesired leakage current in operation. Col. 1, lines 37-43; col. 3, lines 22-26. Referring to Figs. 1-4, a device 10 is shown comprising a substrate 12, and a silicon nitride layer 14 having an outer surface 18. Pin-holes 16 extend through the silicon nitride layer 14. Col. 3, lines 13-29. Referring to Fig. 2, the outer

surface 18 is etched, widening the pin-holes 16 to yield wide pin-holes 16a. Col. 3, lines 30-37. Referring to Fig. 3, a second layer 20 comprising silicon is formed on first layer 14 and within widened pin-holes 16a. Widening of the pin-holes facilitates more conformal and complete filling of such holes. Col. 3, lines 38-47. Referring to Fig. 4, the silicon layer 20 is nitrided into silicon nitride to form a resultant substantially pin-hole – free silicon nitride composite layer 25. Col. 3, lines 48-67. Pin-hole problems in layers of materials other than silicon nitride can be addressed in the same manner. Col. 4, lines 48-52.

Srinivasan fails to disclose and fails to suggest providing a reaction initiator on a substrate prior to providing a dielectric layer on such a substrate. Srinivasan instead etches pin-holes and then refills them. Moreover, Srinivasan fails to disclose and fails to suggest the provision of a second dielectric material that reacts with such a reaction initiator. Srinivasan accordingly fails to disclose and fails to suggest claim 12. Srinivasan accordingly fails to disclose and fails to suggest claim 19, which depends from claim 12.

The Rejection Of Claim 7 Under 35 U.S.C. § 103(a)

Claim 7 stands rejected under 35 U.S.C. § 103(a) as assertedly obvious over Srinivasan. The discussion of Srinivasan above is repeated here. Moreover, this rejection is respectfully traversed, as claim 7 has been cancelled without prejudice.

The Rejection Of Claims 1, 8-13 And 17 Under 35 U.S.C. § 103(a)

Claims 1, 8-13 and 17 stand rejected under 35 U.S.C. § 103(a) as assertedly obvious over Dimitrakopoulos in view of Beuhler. This rejection is respectfully traversed in view of the above amendments in the claims, the above discussion of Beuhler, and the further discussion below.

This rejection is moot regarding claims 1, 8-11 and 13, as such claims have been cancelled without prejudice.

Dimitrakopoulos discloses thin film transistor structures making use of a high dielectric constant thin film gate insulator, an organic semiconductor such as pentacene, and a metal, conducting polymer, highly doped high conductivity material or a combination thereof as the gate, source, and drain electrodes. Col. 3, lines 18-22. Dimitrakopoulos teaches against the fabrication of thin dielectrics, stating that they are prone to pinhole defects and exhibit lower breakdown voltages and higher leakage currents. Col. 5, lines 50-54. Fig. 6 shows a thin film transistor having as gate insulator a thin film of barium strontium titanate. Col. 6, line 18 – col. 7, line 20.

The Official Action admits on pages 7 and 8 that "Dimitrakopoulos does not teach the dielectric layer being traversed by through holes passing from an interface with the first substrate, to an opposite side of the dielectric layer and a second dielectric material at least partially blocking the through holes." Furthermore, Dimitrakopoulos and Beuhler, taken alone or in combination, fail to disclose and fail to suggest providing a reaction initiator on a substrate prior to providing a dielectric layer on such a substrate. Dimitrakopoulos teaches that thin dielectric layers with pinhole defects are to be avoided. Buehler merely discloses providing a photopolymer on a dielectric film, which is then selectively photopolymerized. Moreover, Dimitrakopoulos and Beuhler, taken alone or in combination, fail to disclose and fail to suggest the provision of a second dielectric material that reacts with such a reaction initiator. Dimitrakopoulos and Beuhler, taken alone or in combination, accordingly fail to disclose and fail to suggest claim 12. Dimitrakopoulos and Beuhler, taken alone or in combination, accordingly fail to disclose and fail to suggest claim 17, which depends from claim 12.

The Rejection Of Claim 14 Under 35 U.S.C. § 103(a)

Claim 14 stands rejected under 35 U.S.C. § 103(a) as assertedly obvious over Beuhler. This rejection is respectfully traversed in view of the above discussion of Beuhler, and as claim 14 has been cancelled without prejudice.

For clarity of the record, the discussion of Beuhler on page 9 of the Official Action is respectfully traversed. Beuhler relates to dielectric films in which pinholes are filled by photopolymer plugs. Col. 1, lines 9 and 10. As shown in Figs. 1 and 2, a photopolymer 20 has been applied to a dielectric surface 16 of a dielectric film 10, wherein pinholes 11 also contain the photopolymer. Col. 2, lines 21-23. Photopolymerization initiation, referred to by Beuhler as "activation", only occurs for the photopolymer exposed to actinic radiation by pinholes 11. Col. 2, lines 25-37. The "initiation" referred to by Beuhler is the actinic radiation that is directed through pinholes to the photopolymer. Beuhler thus fails to disclose and fails to suggest a step of providing a reaction initiator on a substrate. Moreover, Beuhler's "initiation" occurs after forming a dielectric layer – not before.

The Rejection Of Claim 16 Under 35 U.S.C. § 103(a)

Claim 16 stands rejected under 35 U.S.C. § 103(a) as assertedly obvious over Srinivasan in view of Tickle. This rejection is respectfully traversed in view of the above amendments in the claims, the above discussion of Srinivasan, and the further discussion below.

Claim 16 has been amended to be more clear and distinct. Claim 16 has now been converted into independent form. Claim 16 now further recites the steps of: "providing a second dielectric material that at least partially blocks said through holes; said second dielectric material

being applied to said opposite side of said dielectric layer while an electric field is applied to said substrate." New claims 29-33, directly or indirectly dependent from claim 16, have also been added.

Tickle relates to a method for locating and repairing latent pinholes, cracks and microscopic areas of low breakdown voltage in dielectric layers prior to completion of the devices. Col. 1, lines 8-12; and col. 5, lines 15-23. Tickle teaches the application of a voltage across the dielectric to stress areas of latent defects so as to damage or modify these areas. Col. 2, lines 5-8. Dielectric plugs can then be formed by oxidizing an underlying silicon substrate through the defects to repair the defects. Col. 2, lines 26-28. Fig. 1a shows a pinhole 13A formed in a portion of the surface of a silicon nitride layer 13 on a wafer 10. Col. 2, lines 65 and 66. A voltage is applied across the wafer 10 to locally rupture the dielectric in locations where the dielectric is sufficiently weak due to pinholes or other anomalies. Col. 3, lines 62-65. Oxygen will then penetrate any pinhole in the dielectric during a subsequent oxidation step and form a self-healing oxide plug. Col. 3, line 67 – col. 4, line 3. The wafer is then reoxidized in oxygen, resulting in the formation of an oxide plug such as oxide plug 13B shown in Fig. 1B. Col. 4, lines 31-52.

Srinivasan and Tickle, taken alone or in combination, fail to disclose and fail to suggest providing a second dielectric material that at least partially blocks through holes in a dielectric layer on a substrate, the second dielectric material being applied to an opposite side of the dielectric layer while an electric field is applied to the substrate. Srinivasan instead etches pin-holes and then refills them. Tickle instead teaches the application of a voltage across the dielectric to stress areas of latent defects so as to damage or modify these areas, and then forming dielectric plugs by oxidizing an underlying silicon substrate by exposure to oxygen through the

defects to repair the defects. Tickle does not use the application of a voltage during the oxidation of the silicon substrate to refill pinholes. Srinivasan and Tickle, taken alone or in combination, accordingly fail to disclose and fail to suggest claim 16.

Conclusion

All of the presently pending claims, as amended, appearing to define over the applied references, withdrawal of the present rejections and prompt allowance are requested.

Respectfully submitted,

Jay M. Brown
Reg. No. 30,033
LAW OFFICES OF JAY M. BROWN
123 Barnes Spring Court
Cary, NC 27519
(919) 522-0312